

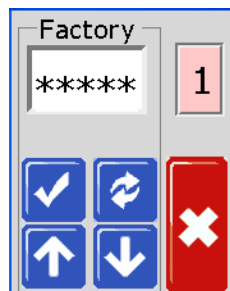
TempMaster™ **M_t** series

User Manual for MT Series of Hot Runner Controller



KEEP THIS SHEET SOMEWHERE SAFE

MT Controllers come with a fixed password which is entered via the two arrow keys.



The Password is...



(up, down, up, up, down)

TempMaster MT User Manual

Amendment Record

Issue	Date	Amendments	Author	Authorised
0.0	Oct 2010	Approval Issue	DH	TJ & SK
1.0	Nov 2010	First Issue	DH	DT & TJ
1.3	Mar 2011	New functions for Inhibit Manual, Alarm Extensions, T/C Auto-Man option, Start Ramp option and Language Option	DH	DT
1.41	Mar 2011	Software Revisions	DH	DT
1.42	Jan 2012	Auxiliary Alarm connector details changed	DH	DT
1.43	Mar 2012	Zone rating corrected to 15A	DH	WT
1.44	May 2012	Revised Star/Delta configuration	DH	DO
2.0	July 2012	Added Zone number, ground fault option and more languages	DH	DT
2.1	Feb 2013	Leak Detect Alarm added	DH	DT

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This manual is intended for use with software Version 1.7 for the MT Series Controller

Our policy is one of continuous improvement and we reserve the right to alter product specifications at any time without giving notice.

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Introduction

Specifications

The following are general specifications. The actual controller supplied may differ in specified options.

Supply Voltage	95-265Vac 3 phase 50Hz with neutral, others available 220/60Hz Delta
Unit Overload protection	Miniature Circuit Breaker
Output overload protection	15A super-quick acting (FF) fuse on both legs
Power output	15A/3000W per zone
Ground Fault Detection	20mA per zone
Thermocouple input	Iron Constantan Fe/Con type 'J', or type 'K'
Control Method	Self tuning PID
Soft-Start with Auto Tune	Unique low voltage method for heater safety
Temperature scale	Centigrade (Celsius) or Fahrenheit
Operating Range	0 - 472°C or 32 - 882°F
Control Accuracy	+/-1°C
Alarm Output	Closing volt-free contacts - 5A max 230V
Interface	2 inches Full colour LCD touch screen
Case Details	Heavy duty metal cabinet

TMXL / MT Compatibility

The MT Series Controller has been designed to give some interchangeability with its predecessor the TMXL2. It is built to the same size and fits into an apparently identical cabinet.

However there is one major physical change which is the main zone fuses. These have been moved from under the cabinet lid on the TMXL2 to "on-the-card" for the MT.

This means that you can pull out individual cards to safely access and change any ruptured output fuse. In the TMXL2 output fuses were located under the cover which meant shutting the system down to gain safe access to replace a ruptured fuse.



DO NOT put TMXL cards into an MT case. Although cards appear interchangeable, putting a TMXL card into an MT case would render the output circuit unprotected since there would be no output fuse.

Conversely it is safe to put an MT Cards into a TMXL case since this would overprotect by having series output fuses on the card and under the case lid.

Safety Instructions



DO NOT enter the cabinet without first ISOLATING the supplies –there are unguarded terminals inside the cabinet which may have a dangerous potential across them.

Where a three-phase supply is used then this potential may be at 380 volts or higher.

Safety Notices - an explanation



A WARNING symbol and message, shown here, identifies where there may be a hazardous situation which, if not avoided, may result in death or injury to personnel.

Most warnings pertain to electrical aspects and you must comply with them to minimise any personal danger.

Installation



Where to use this equipment

Mold-Masters Hot Runner temperature controllers are designed for use in the plastic injection moulding industry as temperature controllers for hot runner systems as commonly used in mould tools. The controllers must not be used in residential, commercial or light-industrial environments. Furthermore, they must not be used in an explosive atmosphere or where there is a possibility of such an atmosphere developing.

They should be installed in a clean dry environment where the ambient conditions do not exceed the following limits:

- * Ambient temperature 10-50°C.
- * Relative Humidity up to 95% (non-condensing)

When in use this equipment does not emit audible noise in excess of 10dBA.

Controller — Tool Connections

The various connections to the system using the cables supplied with the equipment are specified in Appendix A.

Controller Power Supplies

The control cabinet can be manufactured to accept a wide range of supplies and sequence of phases. Refer to the serial plate in the controller cabinet for confirmation of the supply requirements. If the local supply is outside the specified range please contact our Service department for advice.

Tel.: (44) 1432-265768

Fax: (44) 1432-263782

Switching "On" and "Off"

The main power switch is a rotary switch found at the front of the Controller. It is sufficiently rated to disconnect the total load current during switch On and switch Off.

Switching On

When the controller is switched on, all zones go into "Run" mode automatically to start heating the tool.



Switching off the whole controller

When you switch the power off all zone settings are memorised. If you have set different zones to slightly different temperatures in order to get optimum performance then those settings are held and will be the same when you next switch on.

Switching off individual modules

Each module has its own power switch. Use the  button below the screen to turn the module off and on.

Switching off individual zones

To switch off any single zone touch that zone to show the initial menu.	
Touch  to switch off that zone.	
See that zone now displays "OFF". (Repeat the same steps to switch back on again)	

The Controller Cabinet

The power supply to the control cabinet is via a strain-relief mounted cable gland plug wired in star or delta configuration. (Please check your specifications for details of which configuration has been configured.) Connections to the tool are by looms terminating type Contact 24pole connectors with 48pole housing or their equivalents. There are normally two types of cables supplied; a thermocouple connection, and a power connection, both using type H-BE24BS as a preferred connector.

Typical wiring details are shown in Appendix A.

An alarm output option is available for extending the alarm, or, perhaps, inhibiting the injection process.

Controller Modules

The controller is dual-zone modular unit that provides real time temperature control.

Each card has three main components:

- thermocouple input circuits,
- CPU,
- multi-voltage output triacs.

Thermocouple Inputs

The thermocouple inputs have preset responses for both J and K- type thermocouples. The selection of sensor type can be done in Program Menu; this in turn sets the CPU linearization to match the selected thermocouple type.

Central Processor Unit (CPU)

The CPU provides the following facilities:

- closed and open loop control of the zones,
- processes thermocouple and current readings to show on display,
- checks for alarm conditions, including excess current, incorrect thermocouple wiring, zone over temperature condition, low impedance between heater and ground, and generates alarm information for the display screen and alarm relay,
- controls the output power to the on-board triac using a number of self-tuning algorithms

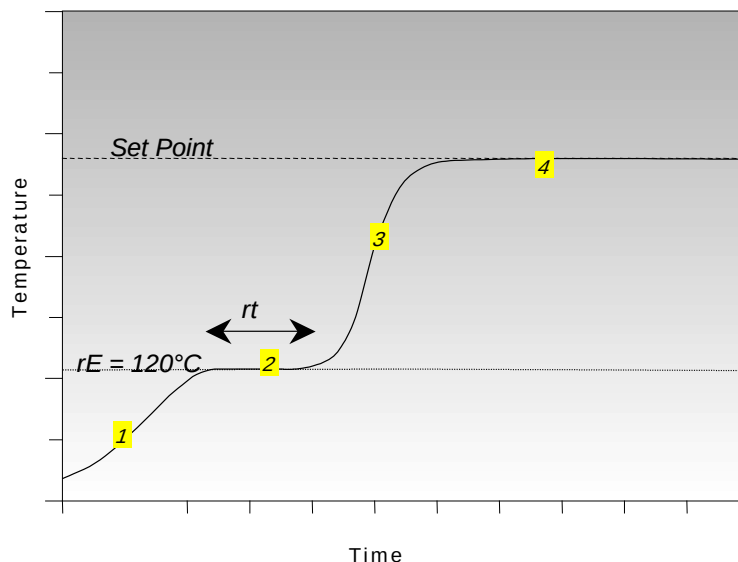
The card requires no analogue calibration and is ready for use once set up from the display console.

Output Triacs

The controller card has a pair of-board triacs that are capable of controlling heating loads of up to 16 Amps peak.

How the MT Controller Works

Mold-Masters® controllers are designed to perform in closed and open loop configurations. However, we consider that the normal operating mode is closed loop. This is illustrated in the following diagram and explained below.



The zone controller slowly ramps up the heater power and simultaneously looks for a positive temperature change at the thermocouple input. The controller verifies the actual rate of rise against a predetermined value in program parameter r1. Power is slowly increased until the correct rate of rise is achieved.

At ramp temperature rE, the dwell time rt is activated (2minutes), this permits any residual moisture in the heating elements to be eliminated. After all zones reached to ramp temperature, they will start heating up together again.

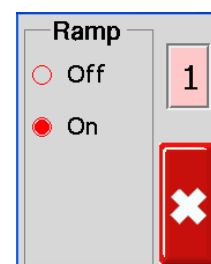
The controller continues to ramp up the temperature to the set point with the speed set in program parameter r2, which should be achieved with minimum over-shoot.

Having built a virtual model to map the tool and heater characteristics, the controller can maintain the temperature at an accurate point with virtually no deviation.

Setting the Ramp feature (On / Off)

Normally the controller starts to heat a zone and then it pauses at around 120° C for 2 minutes in order to dry out any damp that may be present (see page 8 for full description).

If you prefer not to wait for this dwell period then you can use the "Ramp" feature to skip the delay period and attain molding temperature quicker.



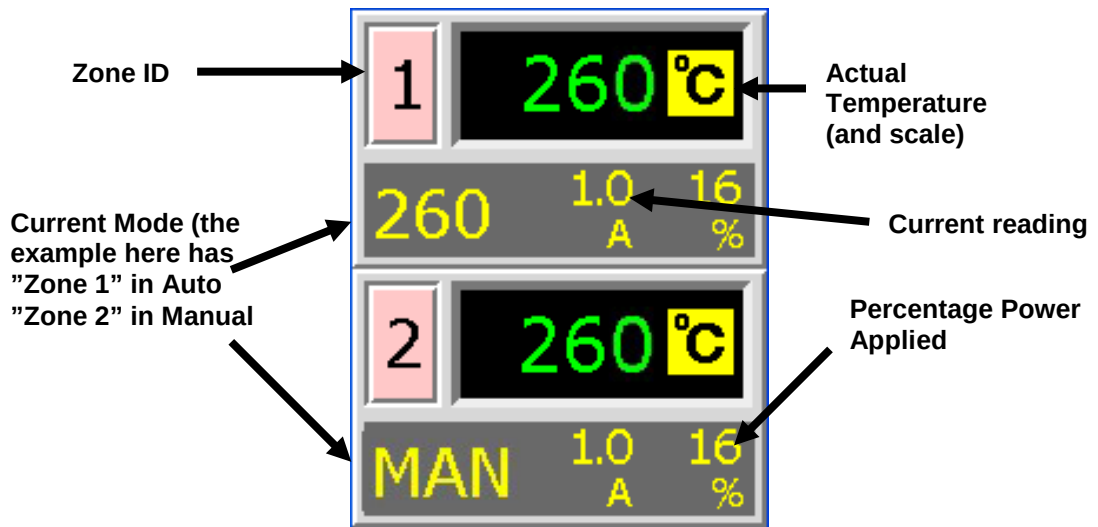
Navigation

This part of the manual introduces you to the controller card to show what facilities are available and what information is available.

Main Display Screens

Once the controller card is turned on, it always shows temperature display for the two zones along with set Temperature, current applied power and percentage power with those various elements shown here.

On each module there will be "Zone 1" and "Zone 2". There is no way for you to configure multiple modules to read successive zones ie Zone 1, Zone 2, Zone 3, Zone 4 etc.

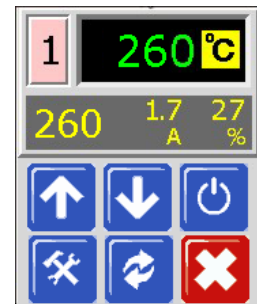


Initial Menu

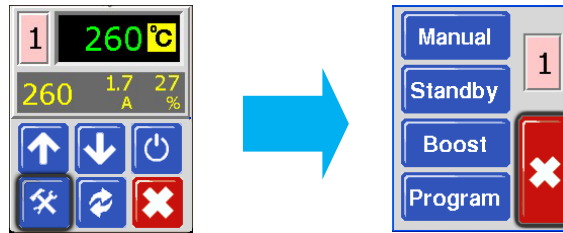
Press anywhere in Zone 1 area or Zone 2 area to get an initial menu for either zone – note that the initial menu will always appear at the bottom half of the screen.

In this menu, the buttons are as follows:

- Set the (auto) temperature or (manual) power level up or down by using the [↑] and [↓] buttons.
Note – keeping your finger on the up or down button will allow the setting to roll on – it does not need repeated dabs to alter the setting by a larger amount.
- Turn the zone on or off by using the [⏻] button.
- Select more functions by touching the [⚙️] button
- Escape from Manual back into the default Auto mode by touching the [🔄] button.
- Leave this menu and return to two zone display by touching the [X] button.



Function Menu



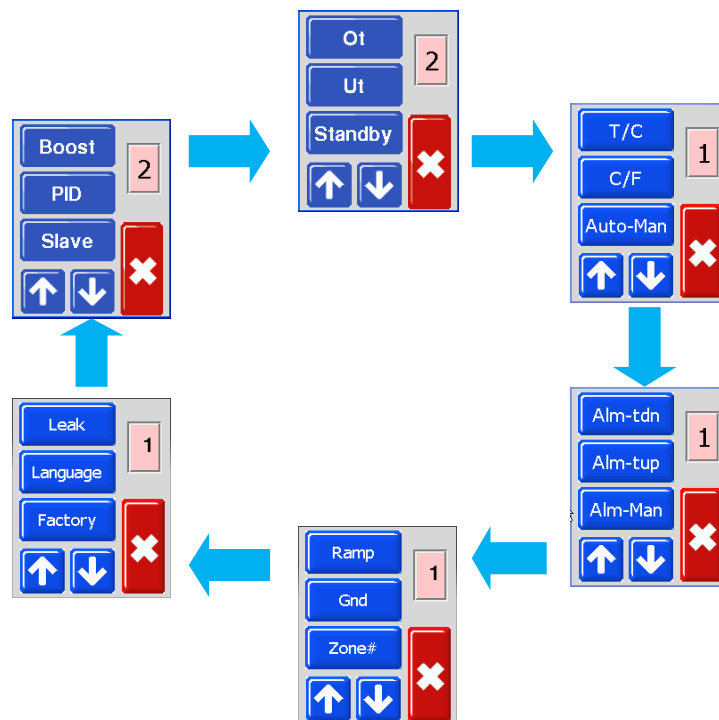
Pressing [X] on the initial menu brings you to the Function menu which has three function options and a further “Program” menu

[Manual] puts the selected zone into manual operation. Returning to Auto is achieved by touching [↻] in the previous options.

[Standby] decreases that zone temperature by a pre-set amount. Returning to Auto is achieved by touching [↻] in the previous options.

[Boost] raises that zone temperature by a pre-set amount. The temperatures remain at this raised level for two minutes then restores to Normal level.

Program Menus



Program Menu

Select [Program] from the function menu to reveal further set-up options. After you enter the program menu then [↑] and [↓] buttons cycle you through the various options seen in the above diagram.

A more complete description of these various parameters is explained further on in the Setting-up and Running sections of this User-Manual.

Setting up your controller

New MT series controllers leave the factory with their default settings which are as shown in this table.

Zone Temperature	260 °C or 500°F
Standby level	100°C or 180°F
Boost level	75°C or 135°F
Over temperature range	10°C or 18°F
Under temperature range	
Ramp	On
Auto-Man	On
Extended Alarms for Manual, Standby and Boost	Off

If you are reconfiguring your controller to a new tool or environment then this chapter of the manual shows how to alter those default settings to your preferred values and afterwards to save them.

Should anything seem wrong with your new settings then it is possible to restore the default settings at any time. (see “Restore Default” on page 36)

What is covered in this section

Setting your preferred Temperature Scale

Matching Sensor Types (J or K)

Changing zone PID Characteristics

Setting the Ramp Feature

Setting Boost Level

Setting Standby Level

Monitoring Temperature Limits

Setting response to Thermocouple failure

Inhibiting users from switching to Manual, Standby or Boost

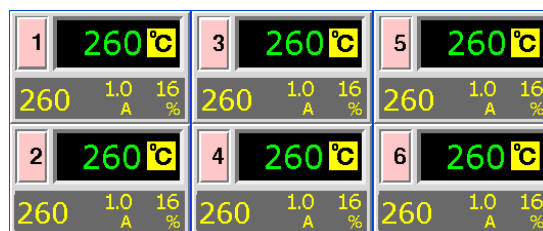
Extending Alarms for Manual, Standby or Boost operation

Language

Setting the Required Temperatures

Setting Zone Numbering

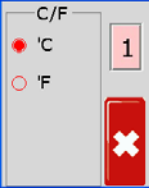
For MT Controllers that have two or more modules there is an option that allows you to number the higher zones in a logical sequence. The result for an MT-06-06 for example would appear as seen here.



To set this numbering style proceed as follows From the Temperature Display Screen, touch either zone to obtain the initial menu.	
Touch to obtain the Function Menu.	
Touch [Program] to obtain the Program Menu.	
Touch or to find the page containing a Zone# option.	
Touch [Zone#] to open the zone numbering option.	
Use and/or to set the desired zone number.	
Touch [X] twice to return to the main display	

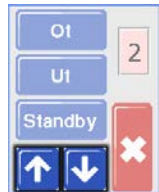
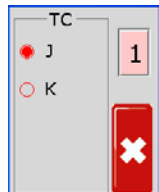
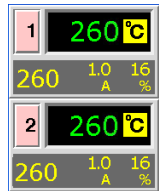
Setting the Temperature Scale

The MT Controller can show temperature in Fahrenheit or Centigrade. Changes in this parameter apply to both zones of the controller card.

From the Temperature Display Screen, touch either zone to obtain the initial menu.	
Touch [✕] to obtain the Function Menu.	
Touch [Program] to obtain the Program Menu.	
Touch [↑] or [↓] to find the page containing a C/F option.	
Touch [C/F] to open the Temperature Scale option.	
Select either [C] or [F] to suit the local operating preference.	
Touch [X] twice to return to the main display. The Main Display is now in Centigrade.	

Matching Sensor Types

There are two different types of probe sensors, J type and K type, with different characteristics. The sensor type is normally configured to a J-type before leaving the factory and should only need to be altered in rare circumstances. Changes in this parameter apply to both zones of the controller card.

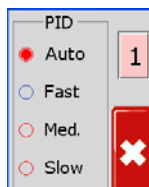
From the Temperature Display Screen, touch either zone to obtain the initial menu.	
Touch  to obtain the Function Menu.	
Touch [Program] to obtain the Program Menu.	
Touch  or  to find the page containing the T/C option.	
Touch [T/C] to open the sensor-type option.	
Select either [J] or [K] to suit the tool in use.	
Touch [X] twice to return to the main display. System is set to running appropriate thermocouple type.	

Changing zone PID Characteristics

On initial start-up, each module CPU reads the zone heater characteristic and determines an appropriate PID curve for that zone. Occasionally the zone may not pick an optimum setting or even if correct you may wish to override that setting and change the zone response time.

In this situation you may select and alter the PID setting for any zone. Generally speaking a small nozzle works best on a "Fast" setting while a larger manifold uses "Med(ium)" and a really large heating platen may require "Slow". If you are having problems matching a zone then consult your local dealer for service advice.

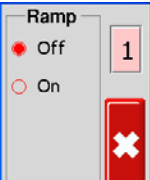
Also note that once the controller has run and the PID curve has been selected, then the screen will show which speed was automatically selected by making that ring blue. In the example below PID has selected "Fast" and shows a blue ring there.

From the Temperature Display Screen, touch either zone to obtain the initial menu.	
Touch [X] to obtain the Function Menu.	
Touch [Program] to obtain the Program Menu.	
Touch [Up] or [Down] to find the page containing the PID option.	
Touch [PID] and select an alternative timing.	
Touch [X] twice to return to the main display. System is set to running appropriate thermocouple type.	

Setting the Ramp feature

Normally the controller starts to heat a zone and then it pauses at around 120° C for 2 minutes in order to dry out any damp that may be present (see page 8 for full description). If you prefer not to wait for this dwell period then you can use the "Ramp" feature to skip the delay period and attain molding temperature quicker.

The default setting is normally Ramp On which follows the normal delay period.

From the Temperature Display Screen, touch either zone to obtain the initial menu.	
Touch [X] to obtain the Function Menu.	
Touch [Program] to obtain the Program Menu.	
Touch [↑] or [↓] to find the page containing the Ramp option.	
Touch [Ramp] and set it to Off.	
Touch [X] twice to return to the main display.	

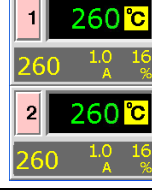
Setting Boost Value

Before you can use the Boost function, you must first configure the Boost value. The Boost settings made here are only for Boost Temperature and are individually set for each zone.

The Boost period is set at 2 minutes and is not configurable.

When boost is activated, the controller will raise the zone temperature. Please note that, on a slow responding manifold, if you set a high boost temperature, the zone may not reach the set boost temperature before the boost time limit expires.

The default or factory Boost setting is 75°C or 135°F. If your controller is set in Centigrade at 200°C, temperature will raise to 275°C. If your controller is set in Fahrenheit at 400°F; temperature will boost up to 535°F.

From the Temperature Display Screen, touch either zone to obtain the initial menu.	
Touch [X] to obtain the Function Menu.	
Touch [Program] to obtain the Program Menu.	
Touch [↑] or [↓] to find the page containing a Boost option. Touch [Boost] to open the value setting option.	
Use [↑] and/or [↓] to set the desired boost Temperature.	
Touch [X] twice to return to the main display.	

Setting Standby Value

Before you activate Standby function, you must first configure the amount. The Standby settings made here are only for Standby Temperature and are individually set for each zone. When standby is activated, those zones with any standby value configured will reduce their temperature.

The default or factory Standby setting is 100°C or 180°F. If your controller is set in Centigrade at 300°C, temperature will lower to 200°C. If your controller is set in Fahrenheit at 580°F; temperature will lower to 400°F.

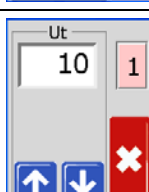
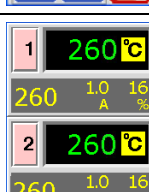
From the Temperature Display Screen, touch either zone to obtain the initial menu.	
Touch [✕] to obtain the Function Menu.	
Touch [Program] to obtain the Program Menu.	
Touch [↑] or [↓] to find the page containing a Standby option. Touch the [Standby] button to open the value setting option.	
Use [↑] and/or [↓] to set the desired Standby Temperature. Note: Hold your finger on ↑ or ↓ to raise or lower value by large amounts.	
Touch [X] twice to return to the main display.	

Monitoring Temperature Limits

Your controller card monitors the actual temperature of each zone and verifies that the zone is operating within specific limits. Rather than fixed points of temperature, the Ot and Ut Limits are set as deviation above or below the set point. If these temperatures are exceeded, the alarm relay on the MT card changes state to raise a disable injection interlock or alarm.

Warn and Alarm limits

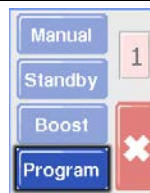
Although there is only one upper and one lower Alarm setting, each gives a visual warning at half way point. If an upper alarm is set to 10 deg then a Warning will show at 5 deg. The same holds true for the under temp alarm level.

From the Temperature Display Screen, touch either zone to obtain the initial menu.	
Touch [X] to obtain the Function Menu.	
Touch [Program] to obtain the Program Menu.	
Touch [Ot] to open the value setting option.	
Use [Up] and/or [Down] to set the desired Over Temperature Limit. Note: Hold your finger on [Up] or [Down] to raise or lower value by large amounts.	
Touch [X] to return then [Ut] to open the Under Temperature Limit. Use [Up] and/or [Down] to set the desired Over Temperature Limit.	
Touch [X] twice to return to the main display.	

Setting Ground Fault Detection

The default setting is “On” where the card will start to decrease power if it detects more than 20mA leakage current. If it detects an earth leakage of 40 mA or more then it reduces output to zero.

If the option is set to “Off” then the zone will continue to deliver normal power.

From the Temperature Display Screen, touch either zone to obtain the initial menu.	
Touch [X] to obtain the Function Menu.	
Touch [Program] to obtain the Program Menu.	
Touch [↑] or [↓] to find the page containing an Ground selection	
Touch [Gnd] to open the page and set it to On or Off as required.	
Touch [X] twice to return to the main display.	

Setting Mold Leak Detection

By monitoring average power it may be deduced that any zone that start to require a higher power level to maintain some temperature may have a fault condition. The most common fault to exhibit this behaviour is that of plastic melt leaking away from the nozzle. This in turn requires more power to heat the extra plastic which is possibly leaking somewhere into the mould or runner system.

Leak Detection in the MT is means of setting a known power level above which the unit triggers an output alarm and gives visual signal if extra power is measured. In this case the alarm is the common outgoing alarm condition and the visual signal is seen when the power level in the zone window displays **red** rather than normal yellow (as seen alongside)



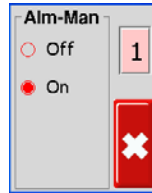
From the Temperature Display Screen, touch either zone to obtain the initial menu.	
Touch [X] to obtain the Function Menu.	
Touch [Program] to obtain the Program Menu.	
Touch [↑] or [↓] to find the page containing a Leak option.	
Touch [Leak] to open the page then touch [↑] and [↓] to set the Leak Detection power level	
Touch [X] twice to return to the main display.	

Setting response to Thermocouple failure

Choose a response for any zone that detects a failed thermocouple.

Normal (Auto-Man OFF) – No action corrective taken- the zone power sets down to 0% and it shows a T/C fatal alarm.

Auto Manual (Auto-Man ON)- The zone has sufficient data, after 10 minutes steady running, to switch to Manual mode at a power level that should hold the previous temperature.

From the Temperature Display Screen, touch either zone to obtain the initial menu.	
Touch [✕] to obtain the Function Menu.	
Touch [Program] to obtain the Program Menu.	
Touch [↑] or [↓] to find the page containing an Auto-Man option.	
Touch [Auto-man] to open the page and set it to On.	
Touch [X] twice to return to the main display.	

Inhibiting users from switching to Manual, Standby or Boost

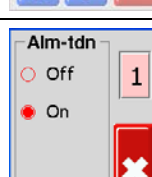
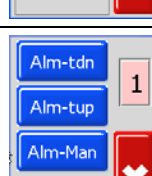
It is possible to stop a user from selecting Manual Control, or Standby or Boost function. To do this open the Factory setting page and tick the M.Dis (Manual Disabled) box as shown below.

From the Temperature Display Screen, touch either zone to obtain the initial menu.	
Touch [✕] to obtain the Function Menu.	
Touch [Program] to obtain the Program Menu.	
Touch [↑] or [↓] to find the page containing a [Factory] option.	
Enter the password and then touch [✓] to access the next screen	
Check the M.Dis box	
Touch [✓] to return to the main display.	
To check this setting touch [✕] and [Program] to see these User function buttons greyed out and no longer function. To reset return to the Factory box and uncheck M.Dis. Note: Selecting this option will inhibit the front panel rocker switch so that Standby or Boost selection there will also be ineffective.	

Extending Alarms for Manual, Standby or Boost operation

There are currently three conditions which may be selected to generate external alarm conditions. These options are available to give an outgoing (closing) signal if the controller is set to Manual (Alm-Man), Standby (Alm-tdn) or Boost (Alm-Tup).

Their default condition is “Off” but any, or all, may be changed to “On” in which case activating Manual, Standby or Boost may generate an alarm output.

From the Temperature Display Screen, touch either zone to obtain the initial menu.	
Touch [X] to obtain the Function Menu.	
Touch [Program] to obtain the Program Menu.	
Touch [↑] or [↓] to find the page containing an Alarm option.	
Touch any of the three options ([Alm -tdn] shown here) to open the page and set it to On.	
Touch [X] once to return to the Alarm Selection in order to select more Alarm options	
Touch [X] a second time to return to the main display.	

Language

There are four language options available for the MT controller and selection is done as follows.

From the Temperature Display Screen, touch either zone to obtain the initial menu.	
Touch [ >] to obtain the Function Menu.	
Touch [Program] to obtain the Program Menu.	
Touch [ >] or [ >] to find the page containing a Language option.	
Touch [Language] to open the page and set it to the required language	
Touch [X] twice to return to the main display.	

Setting the Required Zone Temperatures

Once all the user options have been set then you should set the normal operating temperatures.

From the main display touch whichever zone whose temperature you wish to set.	
Use [↑] and/or [↓] to adjust the set temperature. Note: you do not need to touch just once for each degree change - keeping your finger or stylus on the button will allow the temperature to run up or down until it reaches the desired set point.	
Touch [X] to return to the main display. Repeat for other zones.	

Running your controller

'Running your controller' is concerned with everyday use of the controller for normal production use. This is considered as selecting an appropriate run mode for the machine according to whether the tool is working or waiting. It may also be necessary to make changes to the heater temperatures and to use the graphical display of recent performance, which may help such decisions.

What is included in this section

Run Mode

Off Mode

Standby Mode

Manual Mode (open loop control)

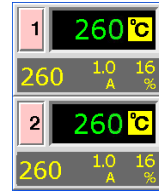
Slave Mode

Standby Mode

Boost Mode – how to apply a short increase

Changing Set Temperature

Run Mode

Controller here shows one zone turned Off.	
Touch that zone, and then touch [⏻] to Start	
Touch [X] to return to main screen and see Zone 1 now in Auto-Run mode. Repeat these steps for the other zone if needed.	

Off Mode (Single Zone)

Each card controls two zones at a time, which can be turned off individually.	
Touch either zone and then touch [⏻] to Stop.	
Touch [X] to return to main screen and see Zone 1 now in Off mode. Repeat these steps for the other zone if needed.	

Off Mode (Single Module)

Turn the module off by touching the [⏻] button on the front of the individual card.	
---	---

Manual Mode

Manual mode (open loop working) can be simply selected as an alternative to running in Auto (closed loop).

If the screen at step three shows the Manual, Standby and Boost buttons greyed out then this function has been inhibited (see page 23).

From the Temperature Display Screen, touch either zone to obtain the initial menu.	
Touch [X] to obtain the Function Menu	
Touch [Manual] to enter manual mode and go to open-loop working.	
Touch [X] to return to main display and see that Zone 1 is now running in Manual Mode.	

Manual Mode - Power Level

Touch the Manual zone to obtain the initial menu.	
Touch [↑] to raise, or [↓] to lower, the power setting (and hence the temperature).	

Slave Mode

Slave mode is an alternative to Manual and can be selected if one zone has a faulty thermocouple. The Slaved zone then mimics the same power output as the healthy zone and, provided that they had been running at a similar power level previously, then the slaved zone will hold a similar temperature.

From the Temperature Display Screen, touch either zone to obtain the initial menu.	
Touch [X] to obtain the Function Menu.	
Touch [Program] and use up/down keys to find Slave.	
Touch [Slave].	
Touch Slave [On].	
Touch [X] twice to return to main display. See that Zone 1 displays "S2" to indicate it is slaved to Zone 2.	
To restore to Auto repeat the first five above steps and select Slave [Off]	

Standby and Boost Mode

There are two options for switching to standby or boost mode.

1. You can set each zone individually by using the module touch screens.
2. Alternatively you can switch all zones together by using the cabinet Boost/Normal/Standby selector shown below.



Standby – whole cabinet

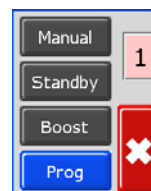
Switch the Boost/Normal/Standby selector towards the right and select Standby. All zones are set down by the standby amount and remain at that lower temperature until the switch is restored to the centre off position.

Boost – whole cabinet

Switch the Boost/Normal/Standby selector towards the left and select Boost. All zones are raised by the boost amount for a set period of two minutes even though the switch may be left in Boost position.

No Standby or Boost option

Note that if the Factory setting has been set to Manual Disable then the Standby/Boost rocker switch will have no effect on controller temperature. If you suspect it may have been set then touch any zone and then touch [✖] to obtain the Function Menu. If the three buttons have been greyed out, as in this view, then Standby and Boost are not available.



Standby/Boost individual zones

These are described on the following pages.

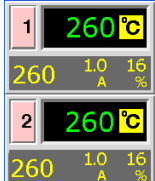
Standby mode – Individual zones

This mode is available for times when the mould-tool is paused. In this condition, all the zone temperatures can be reduced by the predetermined amount, which helps to prevent degradation on certain materials. To set the decrement, refer to “Setting Standby Level” on page 18. Once standby mode is activated, both zones would be reducing to standby temperature.

If the screen at step three shows the Manual, Standby and Boost buttons greyed out then this function has been inhibited (see page 23).

From the Temperature Display Screen, touch either zone to obtain the initial menu.	
Touch [✕] to obtain the Function Menu.	
Touch [Program] to obtain the Program Menu. Touch [Standby] to enter Standby mode and reduce zone temperatures.	
The screen reverts to main display but you can see the standby temperature and confirmation message “tdn” flash alternately in the Actual Temperature window.	

To come out of standby

Touch the Standby Zone to obtain the initial menu	
Touch [↺] to come out of Standby and revert to Auto	
Touch [X] to return to main display.	

Boost Mode – Individual zones

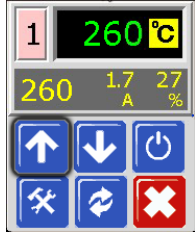
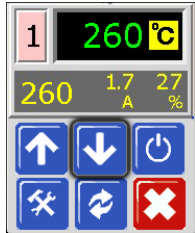
This mode provides a means of temporarily boosting the zone temperature for a non user-configurable period of 2 minutes.

If the screen at step three shows the Manual, Standby and Boost buttons greyed out then this function has been inhibited (see page 23).

From the Temperature Display Screen, touch either zone to obtain the initial menu.	
Touch [X] to obtain the Function Menu.	
Touch [Program] to obtain the Program Menu. Touch [Boost] to enter boost mode for the fixed 2 minute period.	
The screen reverts to main display but you can see the boosted temperature and confirmation message “tup” flash alternately in the Actual Temperature window.	

Changing Set Temperature (Auto or Manual)

Using the up and down buttons changes temperature setting for both Auto and Manual zones

Increase Setting Touch on the zone to display the initial menu and touch [↑] to raise the temperature. Touch [X] to revert to main Display.	
Decrease Setting Touch on the zone to display the initial menu and touch [↓] to lower the temperature. Touch [X] to revert to main Display.	

Maintaining your controller

Servicing and repairing your controller



Always isolate your controller at source before you open the unit to inspect it or replace fuses.

When it comes to machine maintenance there is very little that you need to do to look after it.

Replacement parts

We do not expect that you will need to repair any controller parts at board level, other than fuses. In the unlikely event of any board failure then we provide an excellent repair and exchange facility for all our customers.

Cleaning and Inspection

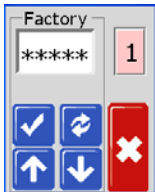
Any excess dust that has entered into the cabinet may be removed with a light brush and vacuum cleaner.

External cables should be checked to see that there has no damage to the flexible conduit, plugs or sockets. If the flex has been squashed, if there is visible damage, or if there are any exposed conductors, then, for your own safety, it must be replaced.

If the equipment is subject to vibration then we recommend that you use an insulated screwdriver to check that no terminals have become loose.

Restoring factory settings and recalibration

There are two main functions which are available for restoration and recalibration. These are available via the Factory option which is password protected.

From the Temperature Display Screen, touch either zone to obtain the initial menu.	
Touch  to obtain the Function Menu	
Touch [Program] to obtain the Program Menu Touch  or  to find the page containing a [Factory] option.	
Enter the password and then touch  to access the next screen	
The Factory screen gives two options which are... Defaults – restore the unit to default settings CAL – enter a calibration check routine M.Dis – enable or disable user options These are described below...	

Default settings

These are the settings which would have been applicable when the unit left the factory and was first received. They are:

Zone Temperature	260 °C or 500°F
Standby level	100°C or 180°F
Boost level	75°C or 135°F
Over temperature range	10°C or 18°F
Under temperature range	
Ramp	On
Auto-Man	On
Extended Alarms for Manual, Standby and Boost	Off

Calibration Routine

Before starting Temperature calibration you need

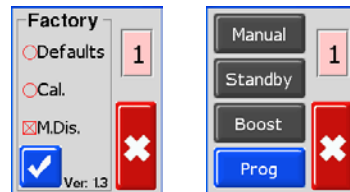
- a) a Thermocouple simulator capable of providing accurate set points of 20°C and 400°C.
- b) a suitable connector plug so that you can connect your simulator to the appropriate zones without any heater zones being connected. If in doubt consult the loom wiring diagram to check for heater and t/c pin connections.

Calibration sequence

1. Connect the simulator to the normal T/C inputs for both zones on the module being calibrated.
2. Touch [Cal] and [✓] to start the calibration routine.
3. The screen asks for a 20°C source – set your T/C simulator to 20°C.
4. The screen timer counts down as it sets the low range setting.
5. The screen asks for 400°C source – set your T/C simulator to 400°C.
6. The screen timer counts down as it sets the high range setting.
7. The screen informs you that the calibration has completed.
8. Remove the T/C Simulator and temporary connector.

M.Dis Option

It is possible to stop a user from selecting Manual Control, or Standby or Boost function. To do so, check the M.Dis (Manual Disabled) box on this screen



Troubleshooting

Individual Card Diagnostics

The control system has several features which provide a diagnosis of faults in the control system, the tool heaters and thermocouple sensors.

If a zone temperature is seen to deviate from the actual setting beyond the alarm limits then the display will change to White text in Red box and generate a remote alarm

The following is a list of alarm conditions that may be detected and which will also activate the output contacts.

Error Message	Cause	Action
ERR!	Little or no temperature rise has been detected in that zone. When the console starts to apply power it expects to see an equivalent heat rise at the thermocouple. If the Thermocouple has been trapped and pinched elsewhere in the tool or cable then it cannot see the full heat rise that occurs at the tip. If left uncorrected then there is a danger that the zone could overheat and damage the tip. Instead the circuit maintains the output at whatever level it reached when the monitor circuit detected the fault	Check thermocouple wiring, it may be reversed. Heater wiring may be faulty or element may be open circuit.
FUSE	The output fuse for that zone has failed. Please Note: A fuse can only fail due to a fault external to the controller. Identify and rectify the fault before replacing the fuse. Note: The fuse detection circuit requires a continuous low level current through a high impedance bleed resistor to maintain the alarm condition. As a result the load circuit is still connected to the mains voltage supply and it is not safe to attempt to repair or replace the fuse without first isolating the circuit. If the fuse in question is mounted on a control card then it is safe to unplug the board in order to isolate the circuit and replace the fuse on the card.	Replace the fuse with one of the same rating and type, i.e. High Rupture Current load fuse. The blown fuse is located either on the control card.
GND	The system has detected an earth fault.	Check your heater wiring for a low impedance path to earth.

LINE	No mains supply synchronisation pulses being received. The three-phase supply is used in a cross-over detection circuit to generate timing pulses for accurate phase control and firing the triac. If the phase detection fails on one or two phases then there is no pulse to use to measure phase angle and the LINE error message is generated. Meanwhile, all circuits on the healthy phases will continue to work normally.	There is a phase detection circuit on each K-Series card and a common phase detection circuit on all other controller types. Although a fault in such circuits may cause the LINE error message, such fault is very rarely seen. The most common error is either the absence of one phase or, if a plug has been re-wired incorrectly, a swapped phase and neutral. If a LINE error message occurs then switch off and isolate the controller then check supply wiring for presence of all three phases.
REV	The card has detected an abnormal input at the T/C termination that indicates a shorted or Reversed thermocouple.	If the REV alarm persists then you should switch off the controller and investigate the offending zone. Alternatively you could slave the offending zone to a good zone until you have time to clear the fault.
T/C	An open circuit thermocouple has been detected and no auto-response has been selected in the T/C Open Error column of the Setup page.	For immediate recovery you can either slave that control zone to an adjacent zone or change to open loop control. Make a note of the above action so that when the controller is free you can check to see whether the input fuse on the control card has ruptured. If the fuse is good then you may need to check the wiring for faults or even replace the thermocouple.

Other possible fault Conditions

Rapid Temperature Fluctuations

The most likely cause of temperature fluctuations is extraneous voltages being picked up by the thermocouple cable, i.e. common mode. This may be due to poor earthing of the tool or, a faulty shielded thermocouple wire or, alternatively, a faulty heater. We recommend that all earth connections be tested.

Ground fault detection

The Ground fault detection detects any fault caused by earth leakage current. Earth faults can be caused if a tool has been idle for some time and damp has got into one heater. It may be possible to identify the heater and repair the faulty zone by using the adjacent heaters to heat it up and dry it out, so curing the original problem.

Module Removal

To remove a control module from its slot, unscrew four corner screws first. There is no need to switch off the main supply. However, if operational requirements allow, the cabinet may be isolated.

The shrouded terminals on the euroback board are live unless the power supply is switched to OFF.



Overload protection



There is an MCB which offers general overcurrent protect and there are fuses for various subcircuits. Of the two rear panel-mounted fuses, one protects the cooling fans and the second protects the internal back-plane distribution which feeds the individual cards.

If you find that any fuse has ruptured then please make sure that you replace the faulty fuse for a new one with identical characteristics. All the fuse types are listed in the attached tables.

Fans

If any fan has stopped working then first inspect the unit to see if there are any blockages or objects fouling the impellers. Once you are certain that the fan is free to rotate then proceed to check the panel-mounted fuse at the rear of the unit.

Class	1¼" Glass Fuse Antisurge
Rating	2A

Controller Cards

Each module card has separate protection fuses for its on-board power supply, the T/C input and for the heating load output.

On-board Power supply

The module power supply has a mains-voltage glass fuse located alongside the power supply circuit.

Class	20mm Glass "slo-blo" fuse
Rating	315mA

Output Fuse Type: HRC High Speed

If the module shows a "FUSE" alarm then the card may be easily removed and the fuse changed. Only use Ceramic Body Fuses on Control Cards, NEVER use glass bodied fuses.

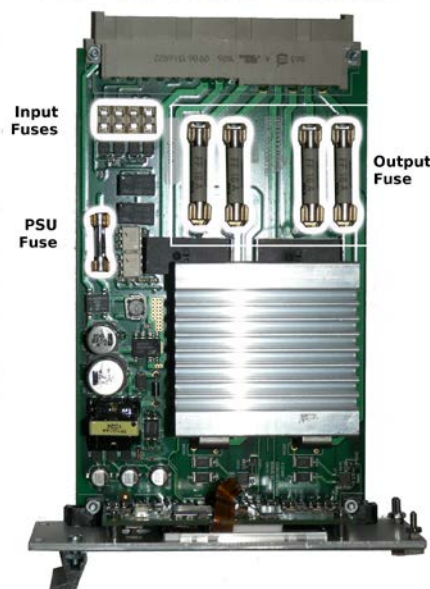
Class	1¼" Ceramic FF Fast blow fuse
Rating	15A

Input Fuse Type: Surface-mount quick-blow

If the module shows a "T/C" alarm then this may indicate that the input fuse has ruptured. The card may be easily removed and the fuse changed.

Part Code	62MAQB5M
Fuse Rating	62mA

MT - Card Fuse Location



Appendix A

MT Wiring Standards

MT WIRING STANDARDS

The following standards only apply to controllers wired to Mold-Masters standard. Other specifications may have been stated when the controller was ordered. Please refer to the supplied specification details.

1. CONNECTION INFORMATION

1.1 Three Phase Designation

Please take extreme care when connecting the controller to the three-phase supply. Incorrect connection may appear to work but can result in damage to the controller. The controller is supplied according to your requirements in either a star or delta supply.



For European Star 380V:

For 2 / 4 zones controller cabinet: Use 4 conductors

Cable Marking	Supply Description
L1	Phase 1 black
L2	Phase 2 gray
L3	Phase 3 brown
N	Neutral blue
Earth Symbol	Earth green/yellow

For 5 zones or higher controller cabinet: Use 5 conductors

Change jumper settings by joining all MP1, MP2, and MP3 to the blue (N) conductor at the terminal blocks.

Cable Marking	Supply Description
R	Phase 1 black
S	Phase 2 brown
T	Phase 3 black
N (Mp1, Mp2, Mp3)	Neutral blue
Earth Symbol	Earth green/yellow

For American Delta 240V:

For 2 / 4 zones controller cabinet: Use 4 conductors

Cable Marking	Supply Description
L1	Phase 1 black
L2	Phase 2 gray
L3	Phase 3 blue
Earth Symbol	Earth green/yellow

For 5 zones or higher controller cabinet: Use 4 conductors

Change jumper settings by joining R-MP3, S-MP1, and T-MP2 at the terminal blocks. Do not link all MP1, MP2, and MP3 together.

Cable Marking	Supply Description
L1	Phase 1 black
L2	Phase 2 brown
L3	Phase 3 black
Earth Symbol	Earth green/yellow

N.B. The delta supply cable does not have a neutral wire.

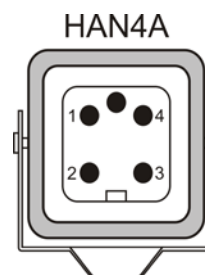
Cable colours may vary therefore wire up according to the Cable Markings.

1.2 Alarm Output

A cabinet connector provides an alarm output from an internal set of relay contacts. Using an external power source the cabinet can initiate a number of warning devices whenever any zone goes into an alarm state. This is commonly used for beacons, audible alarms or informing the moulding machine. The contacts are rated for 0.5A at 220V.

An input can be accepted through the same connector. It may be used for Remote Standby Mode. For exact details, consult the specification for the particular model.

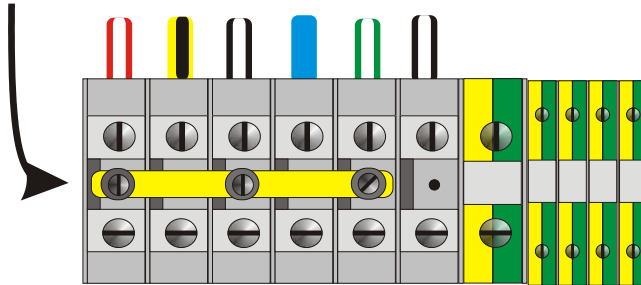
Pin	Connection	Input / output
1	Auxiliary Input signal	Standby Port
2	Auxiliary Input Ground	
3	Alarm 240v contact 1	Normally Open Alarm Contacts
4	Alarm 240v contact 2	



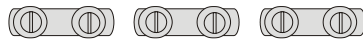
Voltage Selection – Star or Delta

three-way strap installed
to tie three lines to neutral

Star Supply Option

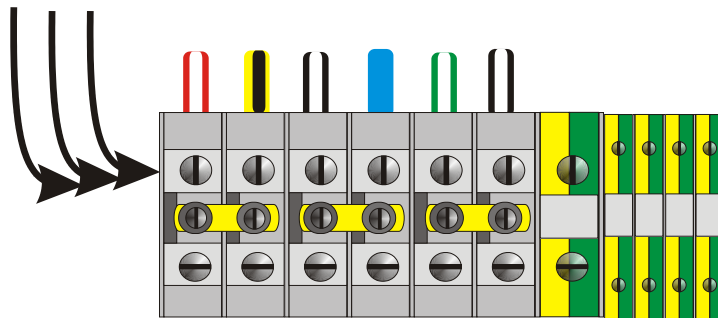


two-way straps not required



two-way straps installed
to tie three lines to phases

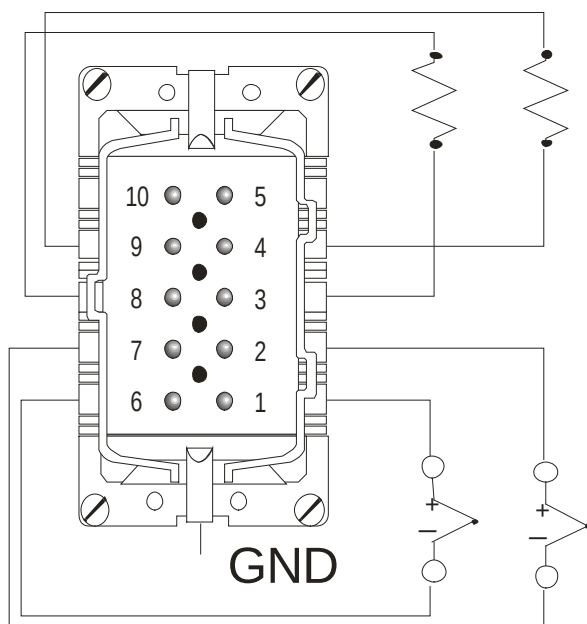
Delta Supply Option



three-way strap not required

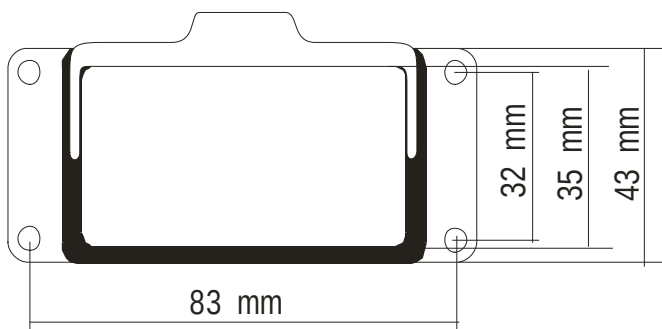
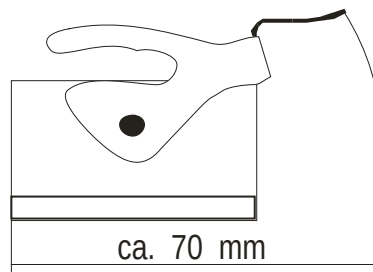
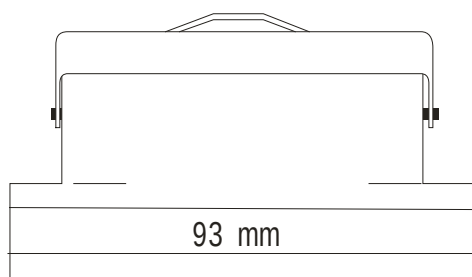


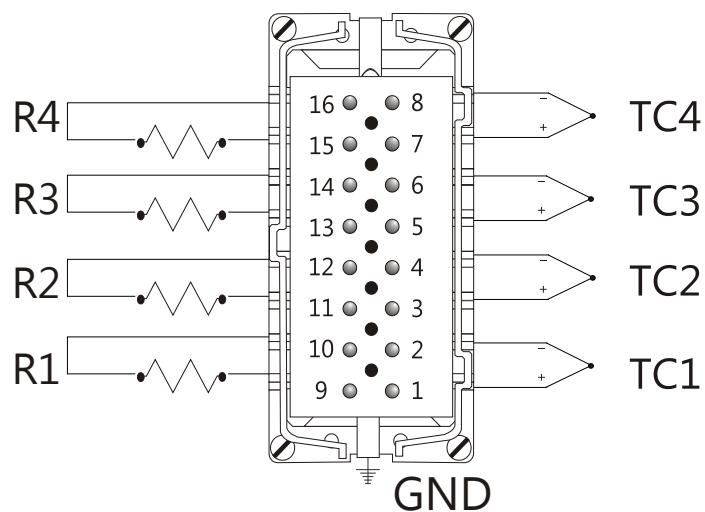
Tool Connector MT – 2 / 2 - 0



Power - TC - Connection	
ZONE	PINS
R 1	3 / 8
R 2	4 / 9
TC 1	1(+) / 6(-)
TC 2	2(+) / 7(-)

Maximum:
230Vac - 16A
Connector:
WZ - 10 - 1RX

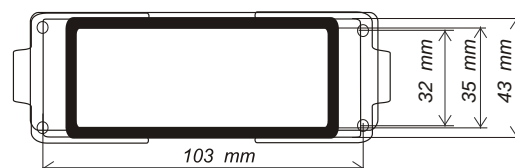
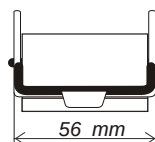
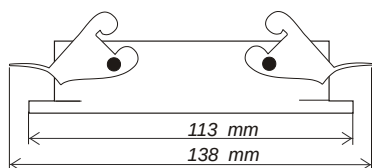


Tool Connector MT-xx-04**Power - TC - Connection**

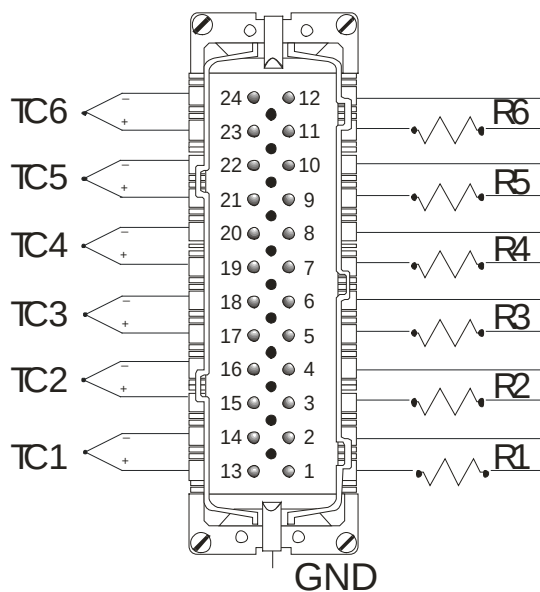
ZONE	PINS
R 1	9 / 10
R 2	11 / 12
R 3	13 / 14
R 4	15 / 16
TC 1	1(+) / 2(-)
TC 2	3(+) / 4(-)
TC 3	5(+) / 6(-)
TC 4	7(+) / 8(-)

Maximum:

230Vac - 16A



Tool connector MT-xx-06



Power - TC - Connection

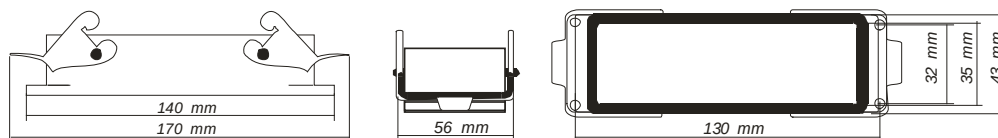
ZONE	PINS
R 1	1 / 2
R 2	3 / 4
R 3	5 / 6
R 4	7 / 8
R 5	9 / 10
R 6	11 / 12
TC 1	13(+) / 14(-)
TC 2	15(+) / 16(-)
TC 3	17(+) / 18(-)
TC 4	19(+) / 20(-)
TC 5	21(+) / 22(-)
TC 6	23(+) / 24(-)

Maximum:

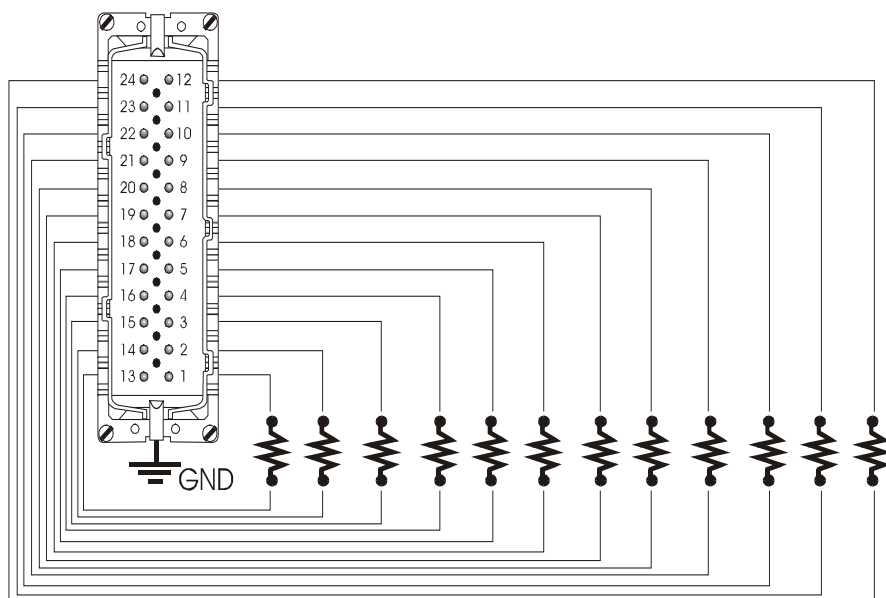
230Vac - 16A

Connector:

WZ - 24 - 2RX



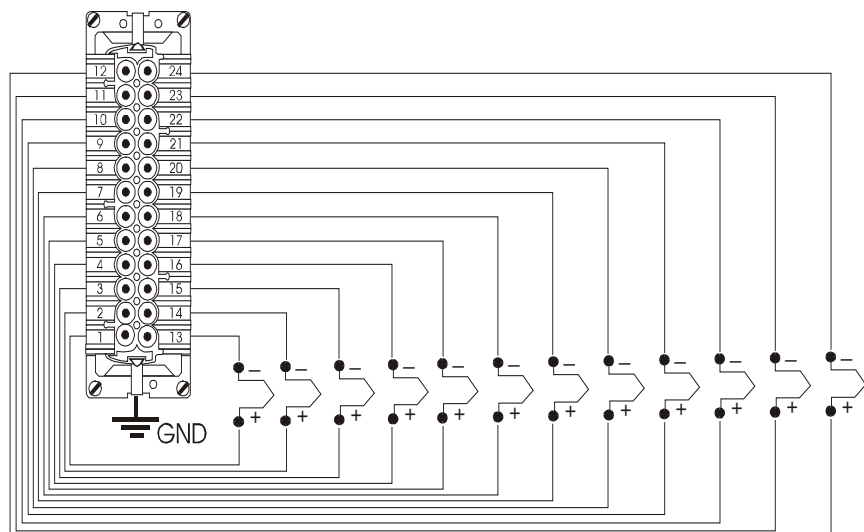
Tool Connector MT-xx-12 & MT-xx-18 (Europe)



P1	P2	Pin
R1	R13	1(L), 13(N)
R2	R14	2(L), 14(N)
R3	R15	3(L), 15(N)
R4	R16	4(L), 16(N)
R5	R17	5(L), 17(N)
R6	R18	6(L), 18(N)
R7		7(L), 19(N)
R8		8(L), 20(N)
R9		9(L), 21(N)
R10		10(L), 22(N)
R11		11(L), 23(N)
R12		12(L), 24(N)

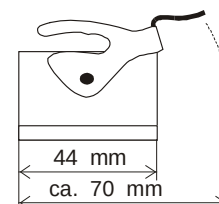
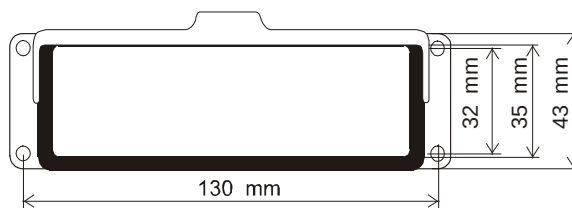
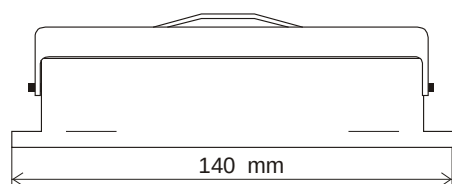
Max. 230VAC / 16A

Type: WZ-24-1RX

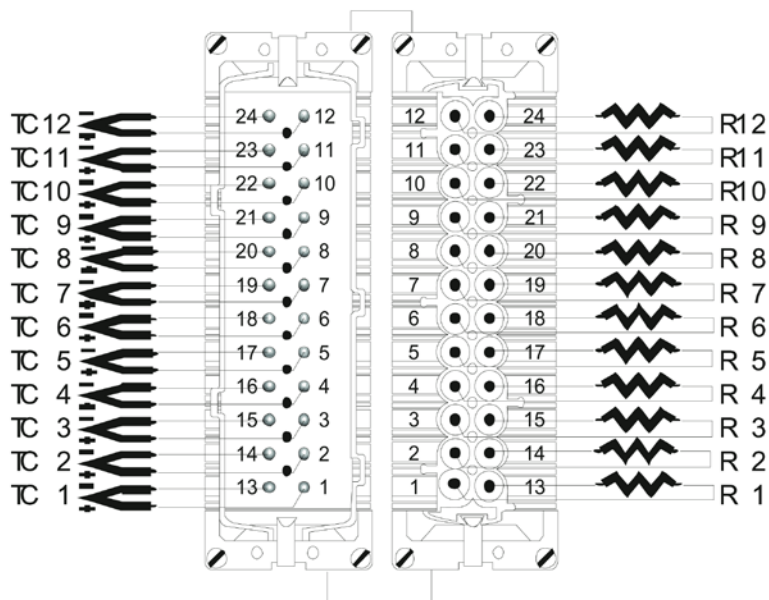


T1	T2	Pin
T/C1	T/C13	1(+), 13(-)
T/C 2	T/C14	2(+), 14(-)
T/C 3	T/C15	3(+), 15(-)
T/C 4	T/C16	4(+), 16(-)
T/C 5	T/C17	5(+), 17(-)
T/C 6	T/C18	6(+), 18(-)
T/C 7		7(+), 19(-)
T/C 8		8(+), 20(-)
T/C 9		9(+), 21(-)
T/C 10		10(+), 22(-)
T/C 11		11(+), 23(-)
T/C 12		12(+), 24(-)

Type: WZ-24-1RX



Tool Connector MT-xx-12 & MT-xx-18 (Canadian Std) M Cable 12

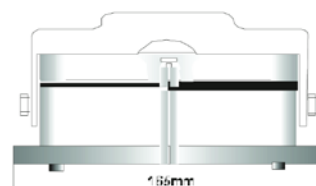
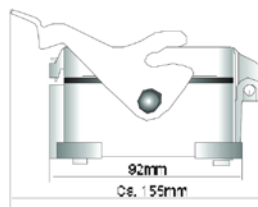
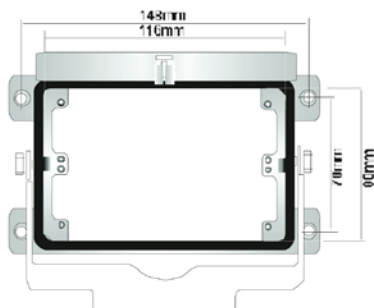


Connection Plug 1

Power	TC	Zone	Fns
R 1	1/13	TC 1	1(+)/13(-)
R 2	2/14	TC 2	2(+)/14(-)
R 3	3/15	TC 3	3(+)/15(-)
R 4	4/16	TC 4	4(+)/16(-)
R 5	5/17	TC 5	5(+)/17(-)
R 6	6/18	TC 6	6(+)/18(-)
R 7	7/19	TC 7	7(+)/19(-)
R 8	8/20	TC 8	8(+)/20(-)
R 9	9/21	TC 9	9(+)/21(-)
R10	10/22	TC10	10(+)/22(-)
R11	11/23	TC11	11(+)/23(-)
R12	12/24	TC12	12(+)/24(-)

Connection Plug 2

Power	TC	Zone	Fns
R13	1/13	TC13	1(+)/13(-)
R14	2/14	TC14	2(+)/14(-)
R15	3/15	TC15	3(+)/15(-)
R16	4/16	TC16	4(+)/16(-)
R17	5/17	TC17	5(+)/17(-)
R18	6/18	TC18	6(+)/18(-)
R19	7/19	TC19	7(+)/19(-)
R20	8/20	TC20	8(+)/20(-)
R21	9/21	TC21	9(+)/21(-)
R22	10/22	TC22	10(+)/22(-)
R23	11/23	TC23	11(+)/23(-)
R24	12/24	TC24	12(+)/24(-)



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